FIG.1

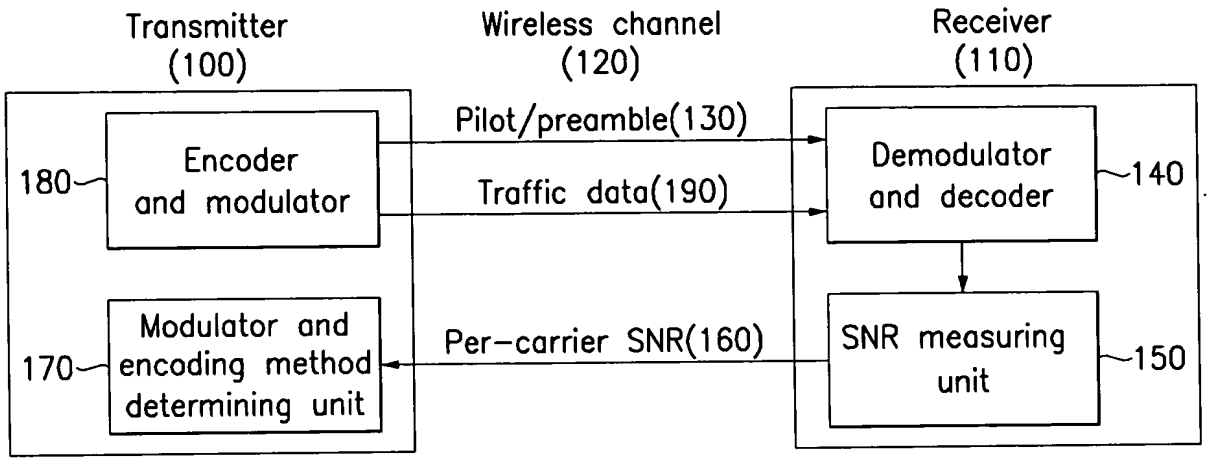

Transmitter
(100)
Wireless channel
(120)
Receiver
(110)
Pilot/preamble(130)
Traffic data(190)
180
Encoder
and modulator
Demodulator
and decoder
140
Modulator and
encoding method
determining unit
170
Per-carrier SNR(160)
SNR measuring
unit
150

FIG.2

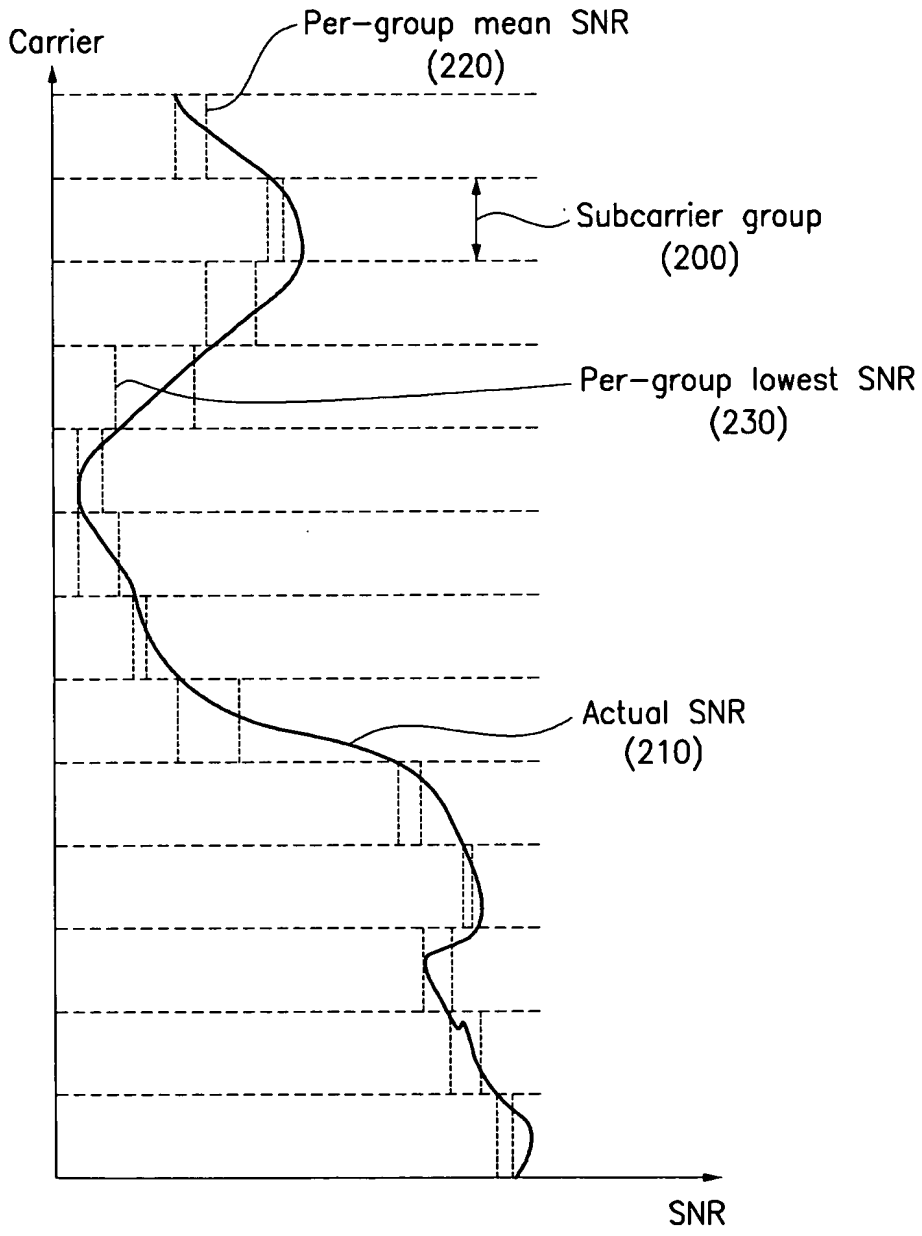
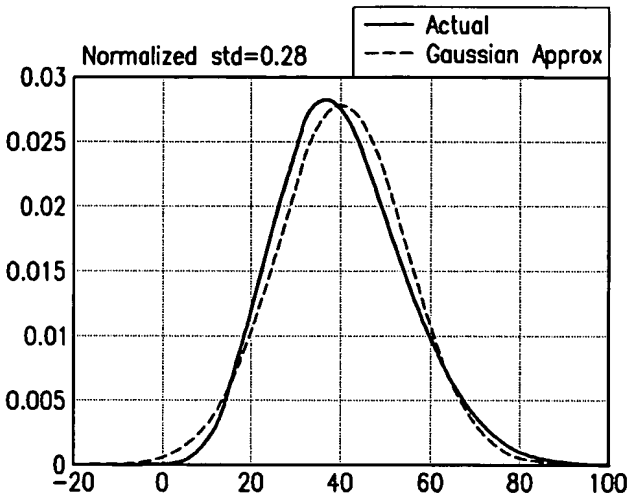
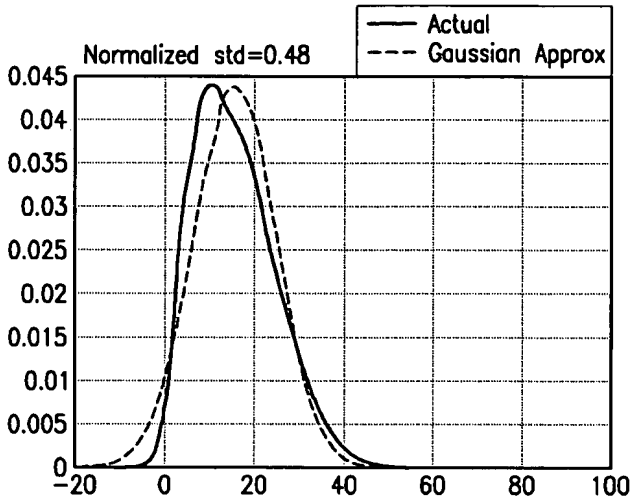

Carrier
Per-group mean SNR
(220)
Subcarrier group
(200)
Per-group lowest SNR
(230)
Actual SNR
(210)
SNR

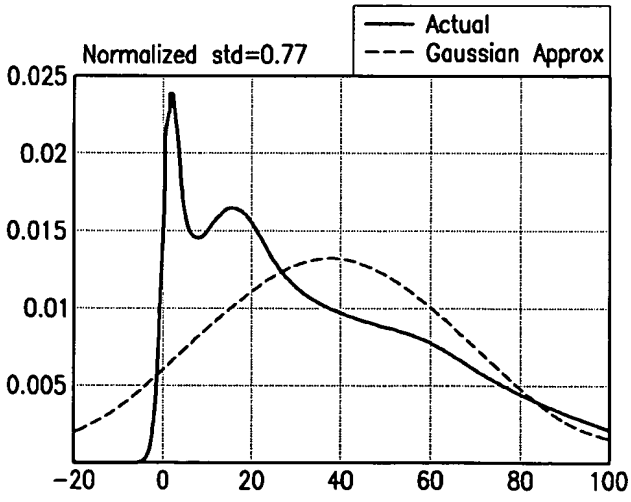
FIG.3


Normalized std=0.28
Actual
Gaussian Approx
0.03
0.025
0.02
0.015
0.01
0.005
0
−20
0
20
40
60
80
100

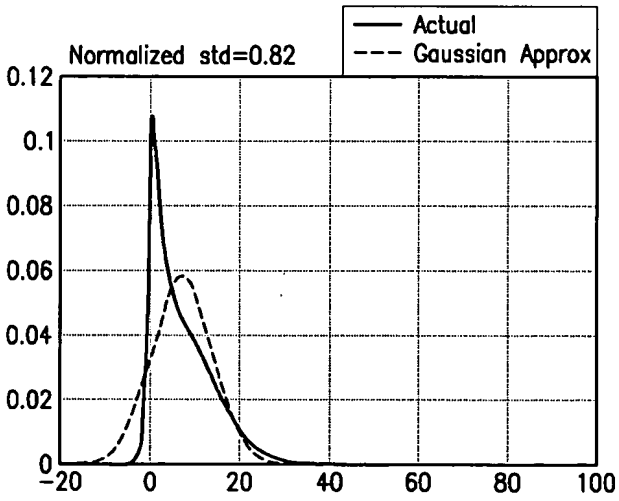
(a)


Normalized std=0.48
Actual
Gaussian Approx
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
−20
0
20
40
60
80
100

(b)

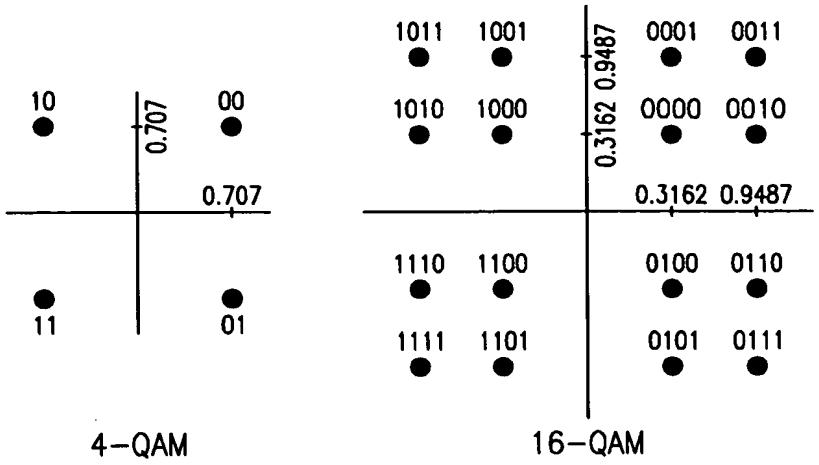

Normalized std=0.77
Actual
Gaussian Approx
0.025
0.02
0.015
0.01
0.005
−20
0
20
40
60
80
100

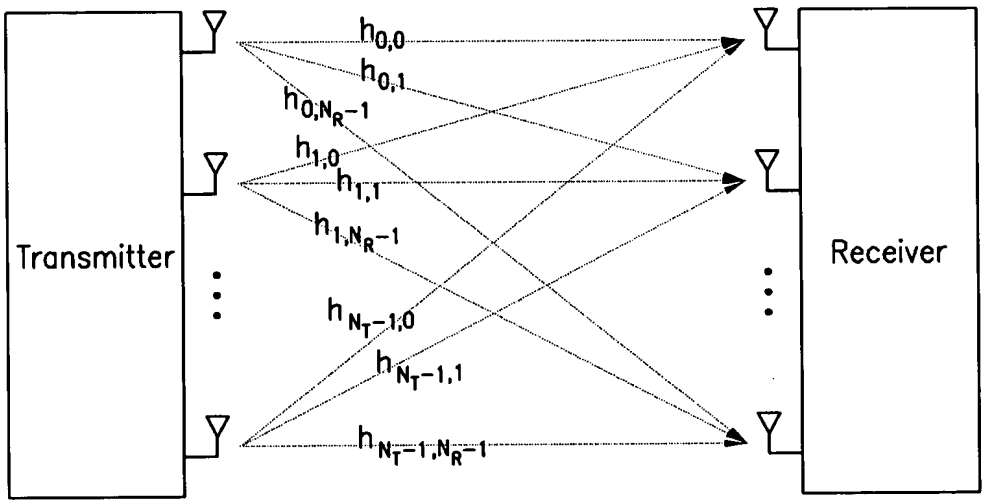
(c)


Normalized std=0.82
Actual
Gaussian Approx
0.12
0.1
0.08
0.06
0.04
0.02
0
−20
0
20
40
60
80
100

(d)

FIG.4


10
00
11
01
0.707
0.707
4-QAM
1011
1001
1010
1000
0001
0011
0000
0010
1110
1100
1111
1101
0100
0110
0101
0111
0.3162
0.9487
0.3162
0.9487
16-QAM


Transmitter
Receiver
$h_{0,0}$
$h_{0,1}$
h_{0,N_R-1}
$h_{1,0}$
$h_{1,1}$
h_{1,N_R-1}
$h_{N_T-1,0}$
$h_{N_T-1,1}$
h_{N_T-1,N_R-1}

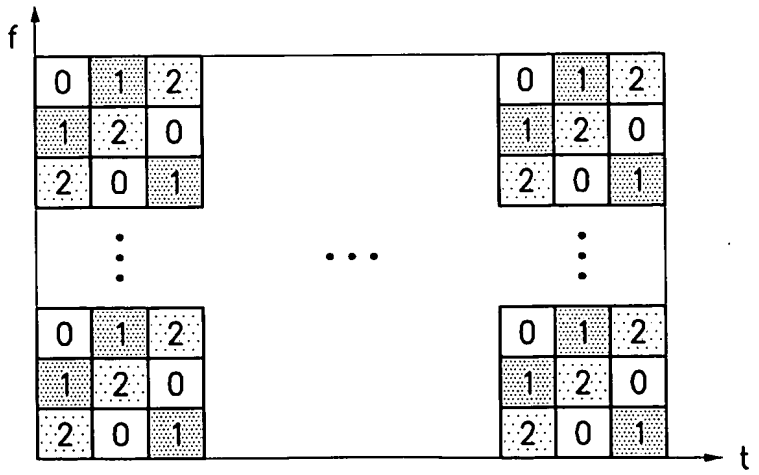

f
t
0 1 2
1 2 0
2 0 1

FIG.5

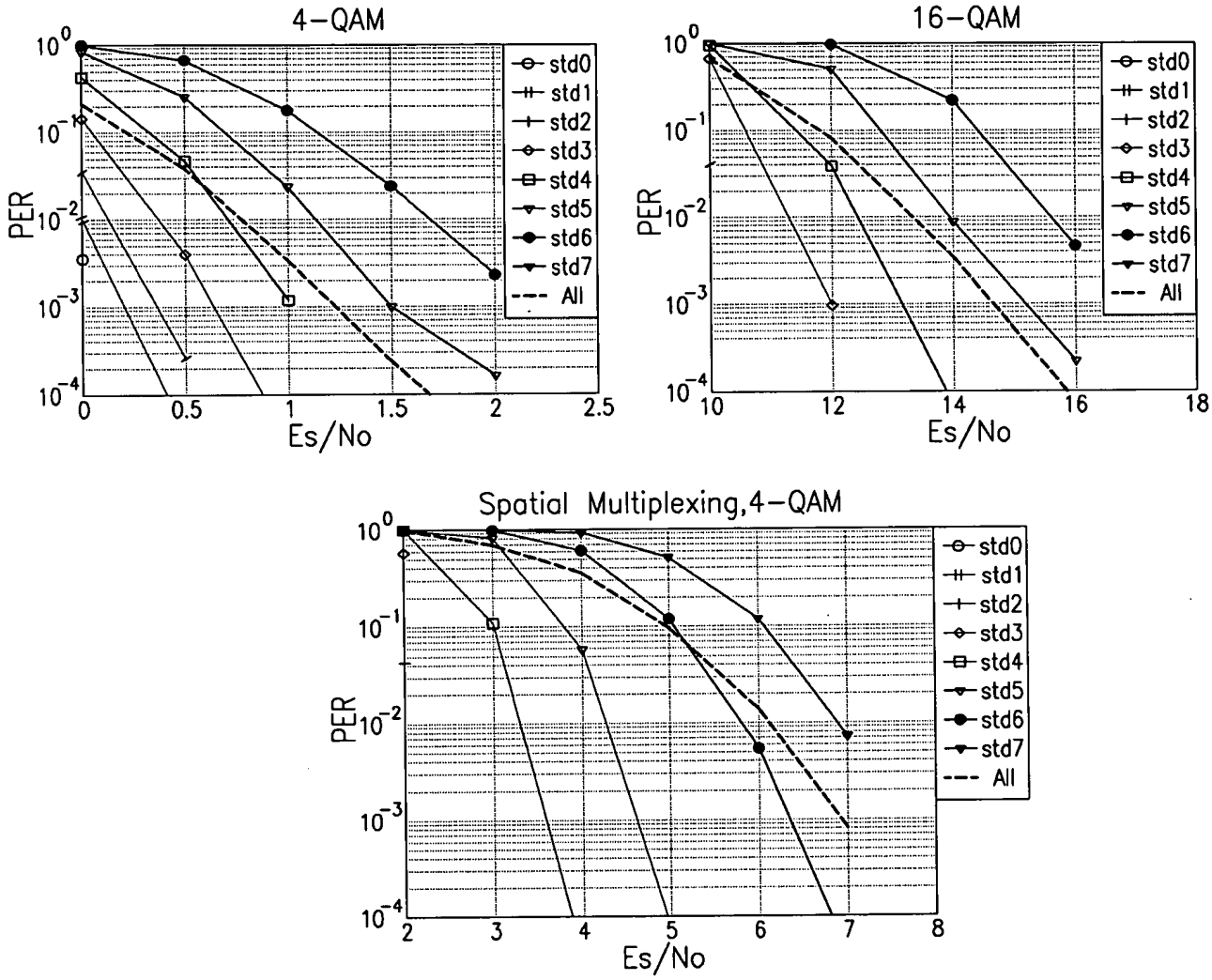

4-QAM
16-QAM
Spatial Multiplexing,4-QAM
PER
Es/No
std0
std1
std2
std3
std4
std5
std6
std7
All

FIG.6

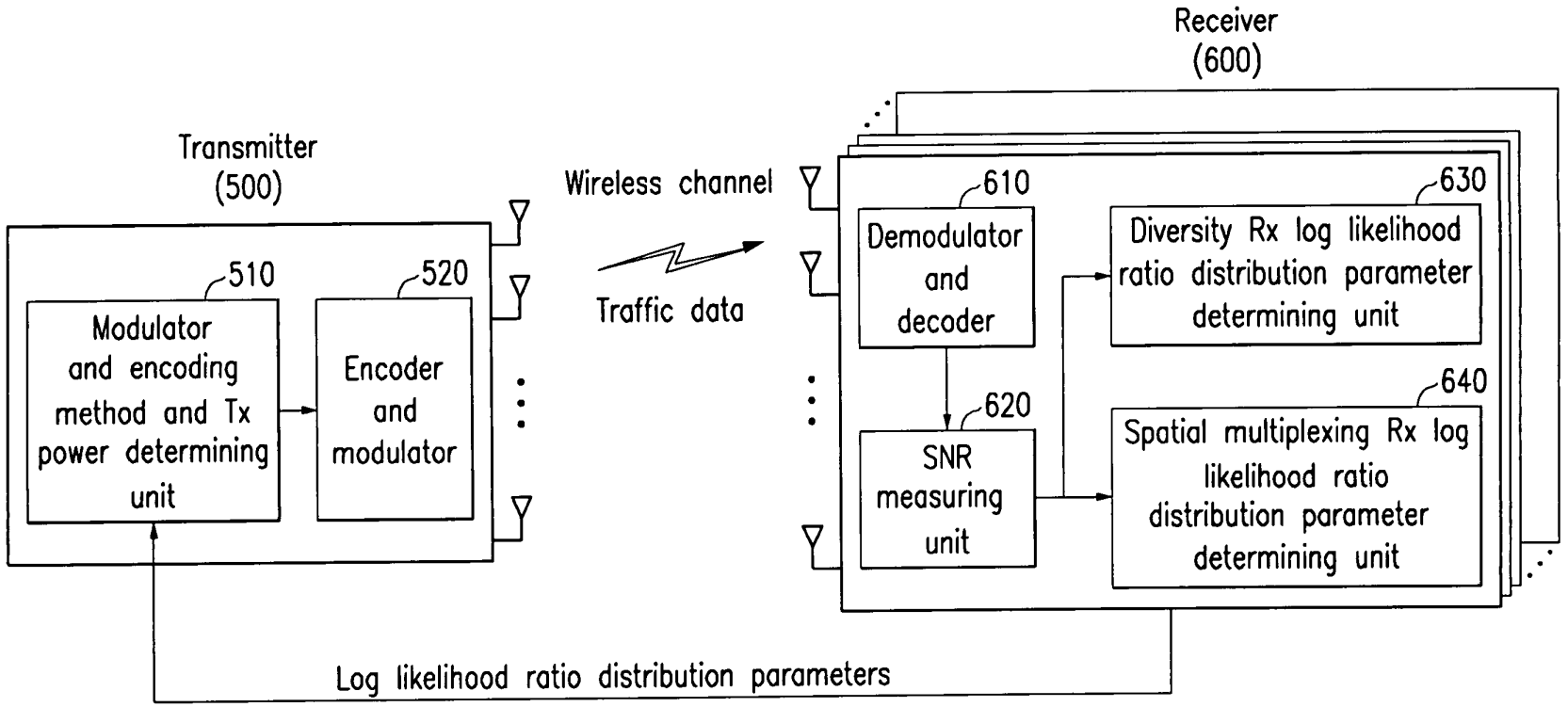

Receiver
(600)
Transmitter
(500)
Wireless channel
Traffic data
510
Modulator and encoding method and Tx power determining unit
520
Encoder and modulator
610
Demodulator and decoder
620
SNR measuring unit
630
Diversity Rx log likelihood ratio distribution parameter determining unit
640
Spatial multiplexing Rx log likelihood ratio distribution parameter determining unit
Log likelihood ratio distribution parameters

FIG.7

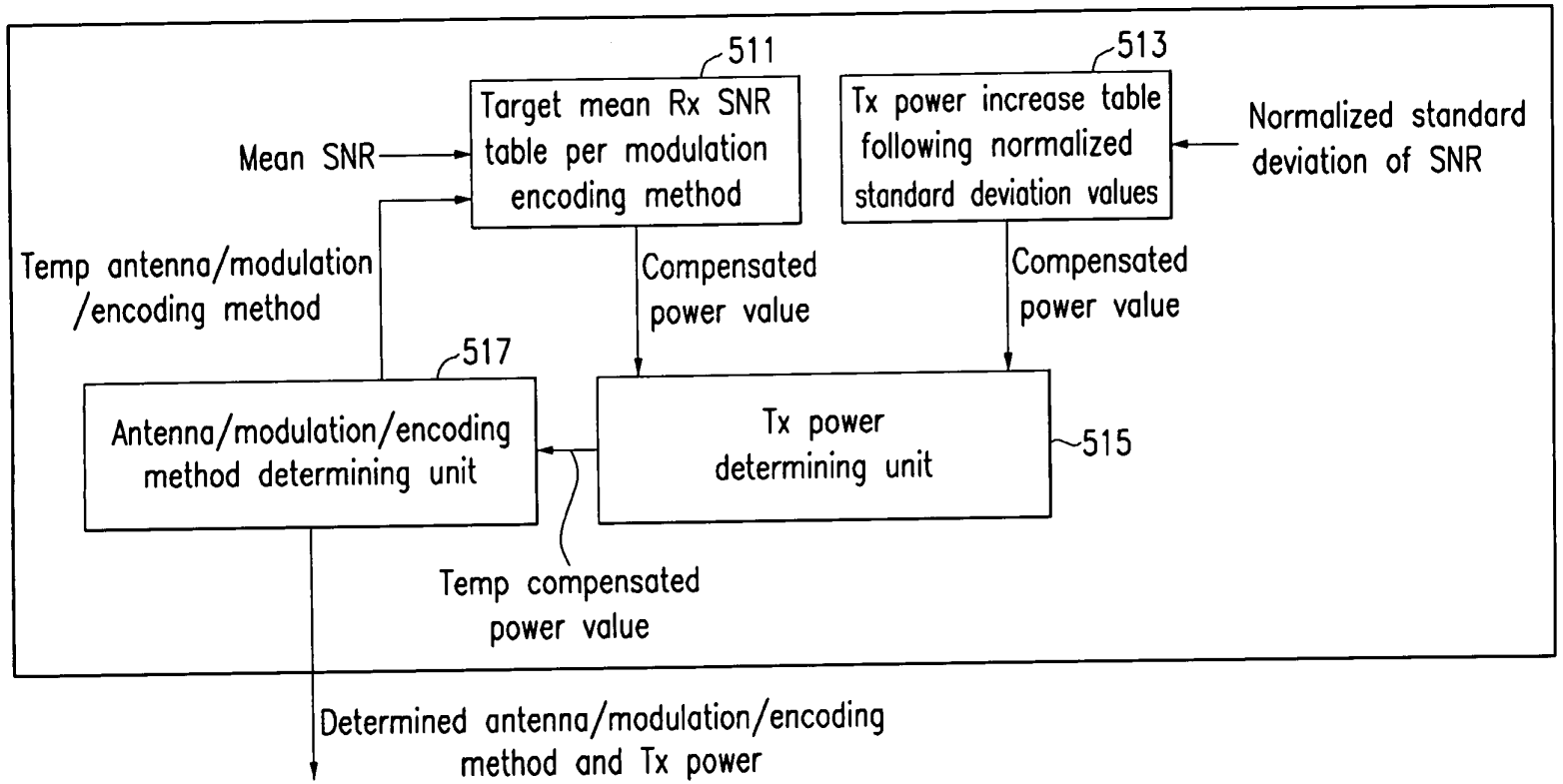

511
Target mean Rx SNR table per modulation encoding method
513
Tx power increase table following normalized standard deviation values
Normalized standard deviation of SNR
Mean SNR
Temp antenna/modulation /encoding method
Compensated power value
Compensated power value
517
Antenna/modulation/encoding method determining unit
Tx power determining unit
515
Temp compensated power value
Determined antenna/modulation/encoding method and Tx power

FIG.8

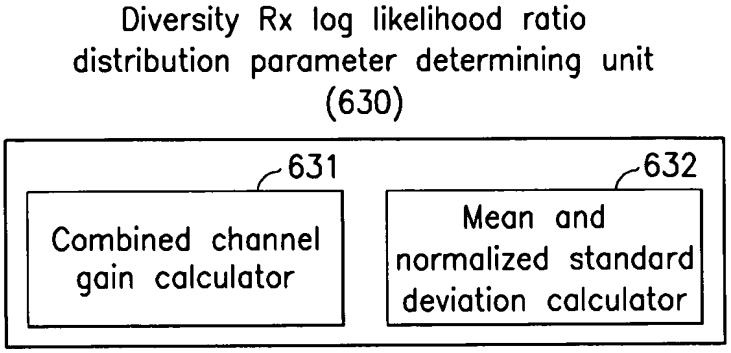

Diversity Rx log likelihood ratio distribution parameter determining unit (630)
631
Combined channel gain calculator
632
Mean and normalized standard deviation calculator

FIG.9

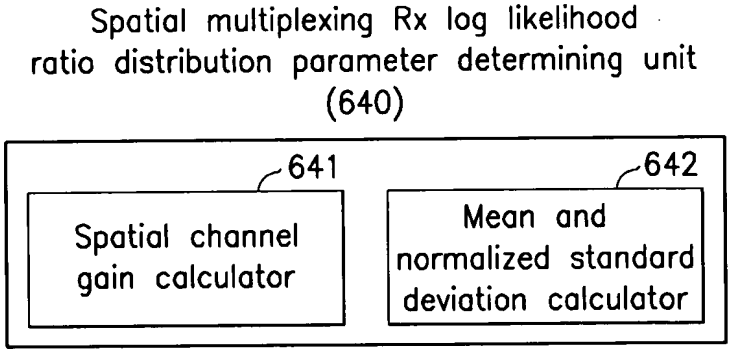
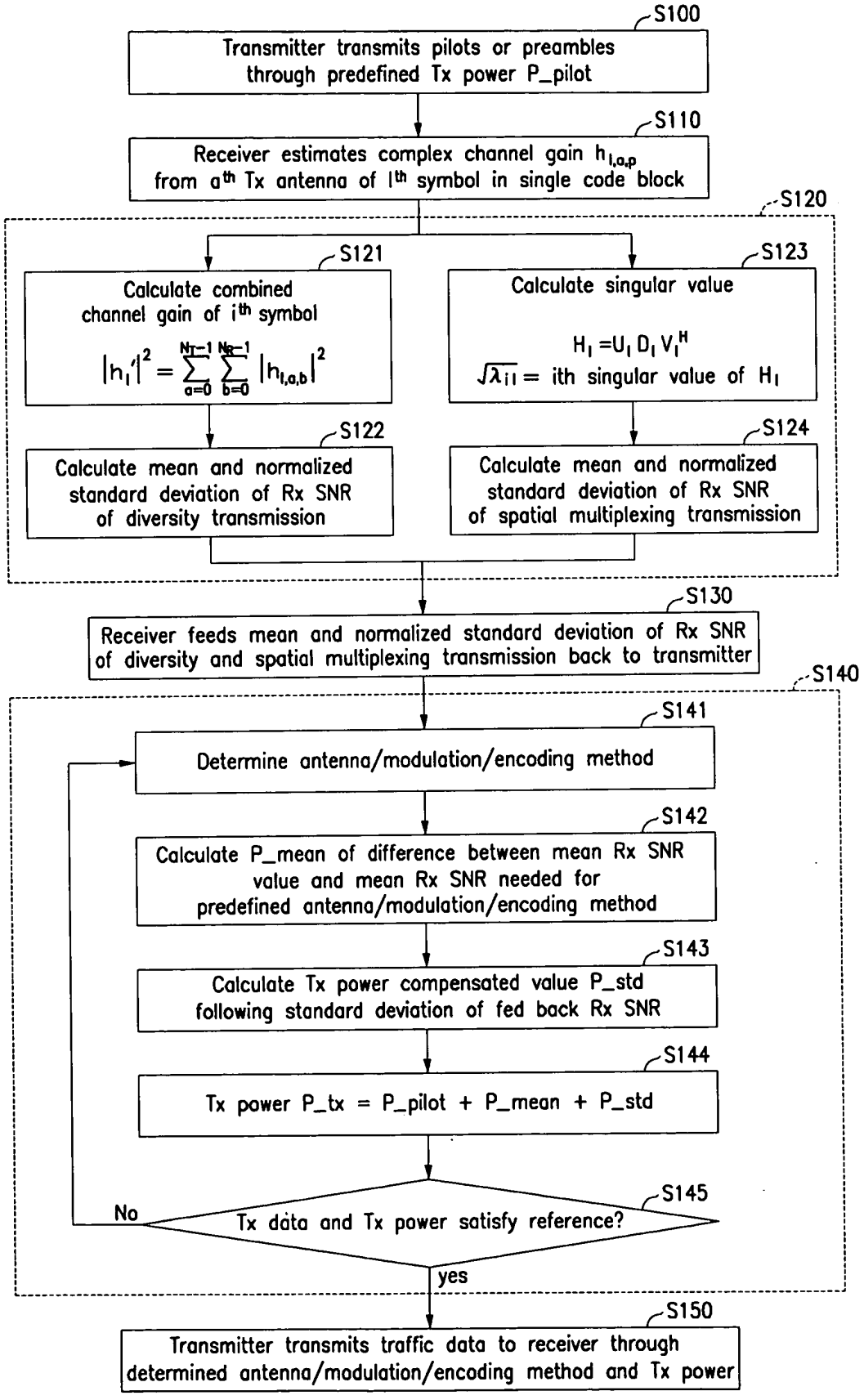

Spatial multiplexing Rx log likelihood ratio distribution parameter determining unit (640)
641
Spatial channel gain calculator
642
Mean and normalized standard deviation calculator

FIG.10


S100
Transmitter transmits pilots or preambles through predefined Tx power P_pilot
S110
Receiver estimates complex channel gain $h_{l,a,p}$ from a^{th} Tx antenna of l^{th} symbol in single code block
S120
S121
Calculate combined channel gain of i^{th} symbol
$|h_i'|^2 = \sum_{a=0}^{N_T-1} \sum_{b=0}^{N_R-1} |h_{l,a,b}|^2$
S122
Calculate mean and normalized standard deviation of Rx SNR of diversity transmission
S123
Calculate singular value
$H_l = U_l D_l V_l^H$
$\sqrt{\lambda_{ii}}$ = ith singular value of H_l
S124
Calculate mean and normalized standard deviation of Rx SNR of spatial multiplexing transmission
S130
Receiver feeds mean and normalized standard deviation of Rx SNR of diversity and spatial multiplexing transmission back to transmitter
S140
S141
Determine antenna/modulation/encoding method
S142
Calculate P_mean of difference between mean Rx SNR value and mean Rx SNR needed for predefined antenna/modulation/encoding method
S143
Calculate Tx power compensated value P_std following standard deviation of fed back Rx SNR
S144
Tx power P_tx = P_pilot + P_mean + P_std
S145
Tx data and Tx power satisfy reference?
No
yes
S150
Transmitter transmits traffic data to receiver through determined antenna/modulation/encoding method and Tx power